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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/544,133	08/02/2005	Takeshi Azami	P8375.0003	7710

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EXAMINER	
MCCRACKEN, DANIEL	

ART UNIT	PAPER NUMBER
1793	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/544,133	AZAMI ET AL.	
	Examiner	Art Unit	
	DANIEL C. MCCRACKEN	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 January 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Citation to the Specification will be in the following format: (S. # : ¶/L) where # denotes the page number and ¶/L denotes the paragraph number or line number. Citation to patent literature will be in the form (Inventor # : LL) where # is the column number and LL is the line number. Citation to the pre-grant publication literature will be in the following format (Inventor # : ¶) where # denotes the page number and ¶ denotes the paragraph number.

Status of the Application

The finality of the office action dated 10/01/2008 is withdrawn in light of the Request for Continued Examination (RCE) filed 1/29/2009. Claims 1-14 are pending with Claims 1-3, 8-10 and 12 currently amended. The amendments will be entered.

Response to Arguments

With respect to the rejection of Claims 1-14 under 35 U.S.C. 103(a) as being unpatentable over US 5,876,684 to Withers, et al. in view of Ullmann, et al., *Nanoparticle formation by laser ablation*, J. Nanoparticle Research 2002; 4: 499-509, Applicants traversal is on the grounds that "[the "Doctor blade" of Withers does not] suggest flattening the surface of said graphite target, as recited in the independent claims." (Remarks of 1/29/2009 at 8). This argument has been considered in light of Applicants clarifying amendments, and is persuasive. The rejection is WITHDRAWN.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 3 and 10-11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With respect to Claims 3 and 10, the "rotation . . . by 180 degrees in a normal line direction of a surface" language is not clear. It is not understood what the 180 degree language is in reference to (*i.e.* the "a surface" language is not clear), and furthermore, the "normal line direction" would seem to imply a 90 degree (or "normal") configuration. Claim 11 is not understood - specifically what the "irradiation position of light in said irradiating the surface of the graphite target with light and in said irradiating the graphite target with light again [*sic*]" is supposed to limit.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 98/39250 to Smalley, et al. and Ullmann, et al., *Nanoparticle formation by laser ablation*, J. Nanoparticle Research. 2002; 4: 499-506 (hereinafter "Ullmann at __") in view of US 5,587,141 to Ohshima, et al.

With respect to Claim 1, Smalley teaches an apparatus with a light source (*i.e.* a laser) and a cylindrical carbon rod. (Smalley 76: 17-27). Given that Smalley recites the subsequent treatment of the nanotubes (*i.e.* a species of "nanocarbon"), it is expected that a "collection unit" is necessarily disclosed, as the nanotubes were in fact "collected." *See* (Smalley 76: 28 *et seq.*). Note here the teaching of Smalley which states "alternating [the laser beam] from the left to the right side of the drum so as to change the angle of incidence on the target surface *to avoid deep pitting*." (Smalley 76: 24-26) (emphasis added). This suggests that pitting of the target by the laser is to be avoided. Note also Ullmann would appear to recite a similar teaching. Ullman likewise employs a laser ablation apparatus with collection chambers and a rotating target. (Ullman at 502 "Fig. 1"). Ullman states "[c]ontinuous irradiation leads to a quasi steady state, because the surface conditions do not change further by more irradiations. Only fractions of a milligram are removed causing the groove to stay shallow and present a similar surface for hours of operation." (Ullman at 502, col. 2). While Ullman would appear to discuss the formation of metal particles, note the various passages of Ullman reciting the formation of carbon particles (*i.e.* "nanocarbon"). *See e.g.* (Ullman at 503, "Table 3"). Thus, there would appear to be a clear teaching and suggestion in the prior art that a uniform target is desirable or that "pitting" of the target by the laser is to be avoided. To the extent neither Smalley nor Ullmann teaches the "surface process unit for flattening the surface" as claimed, Ohshima does. Ohshima recites an apparatus and method for making fullerenes (*i.e.* a species of "nanocarbon"). Ohshima teaches what is generally referred to in the art as an "arc discharge" method for making fullerenes. Like the laser ablation techniques of Smalley and Ullman, energy is delivered to a carbon target, but with arc discharge the energy is delivered via an arc between an anode and cathode. *See*

generally (2: 40 *et seq.*). Like Smalley and Ullman, Ohshima employs a rotating target. *See e.g.* (Ohshima 3: 9-14). Ohshima employs a "scraping member" (*i.e.* a surface process unit for flattening the surface). *See* (Ohshima 3: 27-31; 4: 19-25; 5: 28-31). Note that this scraping member bears a striking resemblance to those disclosed in the instant application. *Compare e.g.* (Ohshima "Figs. 2-4") *with* (S. "Fig. 2"). Ohshima would appear to present a corollary of the teachings of Smalley and Ullman by stating "the carbonaceous deposits are scraped by the blade 8 and collected in the bottom of the chamber *so that the arc discharge can smoothly continue*." (Ohshima 4: 20-22) (emphasis added). One would be motivated to add the scraping member of Ohshima to the laser ablation devices taught by Smalley and Ullmann to remedy the pitting issues noted above. Alternatively, one would be motivated to substitute a laser as taught by Smalley or Ullmann for the anode of Ohshima as a laser would provide for a more continuous mode of operation. Note that in the arc discharge process, the process must be stopped when the anode is consumed. *See* (Ohshima 5: 32-33) ("The feed of DC current was stopped when the anode 6 was consumed."). Substitution of a laser would allow for elimination of this step of stopping to replace the anode. As to Claim 2, Smalley teaches rotating about an axis. (Smalley 76: 20). As to Claim 3, notwithstanding the ambiguities noted above, Smalley recites alternating the angle of the laser (Smalley 76: 24-26) and Ohshima recites "normal" configuration (Ohshima 3: 40) as well as other arrangements of the target relative to the cathode. (Ohshima "Figs. 2-4"). As to Claim 4, Smalley teaches rotating the target, ergo Smalley discloses a "movement unit." (Smalley 76: 20). To the extent Smalley doesn't teach a "movement unit," note that Ohshima teaches a "driving mechanism 5 including an electric motor for rotating the shaft." (Ohshima 3: 12-14). As to Claim 5, note the above discussion of the scraping member. Ohshima recites the

scraping member as "a blade whose edge 8a is maintained in contact with the cathode [carbon/graphite] surface 2a." (Ohshima 29-31). As to Claim 6, see above discussion of "collection unit" in Smalley. To the extent Smalley (which recites treating the collected nanomaterial) does not teach a collection unit, note that both Ullmann and Ohshima do. *See* (Ullmann at 502 "Fig. 1") *and* (Ohshima 4: 45 *et seq.*). As to Claim 7, the "nanohorn aggregate" language is being interpreted as a statement of intended use. Claim 1 (from which Claim 7 depends) is an apparatus claim. "[A]pparatus claims cover what a device is, not what a device does." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original). Here, making the nanohorn aggregate is what the apparatus does, not what it is, which is the laser, target, etc. addressed above.

With respect to Claim 8, the preceding discussion of Claim 1 is relied upon. As noted above, Smalley, Ullman and Ohshima all employ rotating graphite targets. As noted above, Ohshima teaches the flattening unit and subsequent treatment with the anode. Substitution of a laser is an obvious expedient (as noted above) to eliminate the need to replace the anode. As to Claim 9, note that Smalley teaches a graphite rod. (Smalley 76: 19) ("2.5 cm by 5 cm cylindrical carbon target). As to Claim 10, notwithstanding the ambiguities noted above, Ohshima would appear to teach the rotational configuration. *See e.g.* (Ohshima "Figs. 2-4"). As to Claim 11, notwithstanding the ambiguities noted above, it would appear as if Smalley and Ullmann both teach repeated irriadiation of the target due to the rotation described. *See* discussion of Claim 1 *supra*. Smalley likewise teaches movement of the laser. (Smalley 76: 23-24). To the extent some different movement was intended, note that Ohshima teaches various configurations of moving the anode relative to the cathode that would be desirable for utilizing the maximum surface of the

cathode target. (Ohshima 3: 46-54). As to Claim 12, given the scraping member of Ohshima is in contact with the target, it is expected that part of the surface is removed. (Ohshima 3: 31). As to Claim 13, lasers are taught. (Smalley 76: 22).

Claims 1-14 rejected under 35 U.S.C. 103(a) as being unpatentable over Smalley, Ullmann and Ohshima as applied to claims 1-13 above, and further in view of Iijima, et al., *Nano-aggregates of single-walled graphitic carbon nano-horns*, Chemical Physics Letters 1999; 309: 165-170 (hereinafter "Iijima at __").

The preceding discussion of Smalley, Ullmann and Ohshima accompanying the obviousness rejection *supra* is expressly incorporated herein by reference. To the extent Smalley, Ullmann and Ohshima *may* not have disclosed graphite targets (Ohshima did at *e.g.* 2: 64), Iijima does. *See* (Iijima at 166, col. 1) ("graphite target rod"). Note also that Iijima would appear to employ a laser ablation apparatus/method with a rotating target. *Id*. Likewise, to the extent Claim 7 requires nanohorn aggregates and with respect to Claim 14, to the extent neither Smalley, Ullmann or Ohshima disclosed making "nanohorn aggregates," Iijima does. *See e.g.* (Iijima "Abstract") ("An individual particle is composed of an aggregate of many horn-shaped sheaths of single-walled graphene sheets, which we named carbon nano-horns."). One would be motivated to substitute the graphite target of Iijima with the doped graphite targets of Smalley, etc. to make carbon nanohorns for any number of reasons, for example the heat resistive properties of carbon nanohorns taught by Iijima at (Iijima at 170, col. 1-2).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL C. MCCRACKEN whose telephone number is (571)272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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